

PATENT
90065.99R272 (17732.6323)
Response Under 37 CFR 1.111

REMARKS

This amendment is submitted in response to the office action mailed October 11, 2005. It changes claim 39 to be consistent with the suggestion made by the examiner in the earlier office action of July 29, 2005 and thus raises no new issues.

Claims 1-8, 10-15, 17 and 35-41 are pending in the present application. Claims 39-41 are rejected under 35 USC 112, first paragraph and claims 35-41 are rejected under 35 USC 112 second paragraph. The following remarks will show that the rejection under the first paragraph is erroneous and the rejection under the second paragraph is overcome.

All pending claims are rejected under 35 USC 103(a) based upon a new reference Choy (US 5773705) in combination with Schlangenotto '428 and '858 of record. The following remarks will show that the references of record do not show or suggest the claimed P+ P- N- N+ structure with recombination centers substantially in the P- and N- regions and that the evidence of a dramatic increase in UIS performance more than tips the scale in favor of patentability. The remarks will also show that the rejection is clearly erroneous in its interpretation of the P+ region in Choy, the Schlangenotto '428 and '858 patents do not show substantial recombination centers in the P- and N- layers, and the rejection wholly fails to consider the persuasive evidence or dramatic improved results shown in the specification

Claims Conform to 35 USC 112 1st ¶

Claims 39-41 were rejected under 35 USC 112 first paragraph for lacking a written description. Although claim 35 was not rejected, the examiner observed that there was no support for the third boundary limitation. That finding is erroneous. Claim 35 is a generic claim that reads on the embodiments found in Figs. 2 and 4. The location of the third boundary layer is disjunctive. It is well accepted practice to recite species limitation in the alternative in a generic claim. Thus, claim 35 locates the third boundary layer as shown by N+ layer 205 of Fig. 2 that is spaced from the P- region or as shown by the N+ layer 404 of Fig. 4 that is inside the P- region. Claim

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39 reads on the species found in Fig. 2. As a dependent claim, there is no requirement it reads on both species of the generic claim 35.

Claims Conform to 35 USC 112 2d ¶

Claim 35 was rejected under 35 USC 112 second paragraph as unclear. Claim 35 is amended to add the limitation "vertically" so that it is clear the claim covers the a P+ region that is thinner vertically than the P well and the N + region.

This amendment does not raise new issues. If the examiner believed the prior claim could be read two ways, then the examiner was required to examine the claim given its broadest interpretation. Thus, the examination must have included interpreting the claim as thinner horizontally and vertically. At the request of the examiner the claim is clarified to read on only one of the two possible embodiments. Thus, the amendment raises no new issues.

Entitlement of Applicants and
burden of examination

Applicants are entitled to a patent unless the evidence of the prior art shows or suggests the invention. This is the essential thrust of 35 USC § 102 and 103. The following remarks will show that the examiner has failed to make a *prima facie case for obviousness* because the references do not show one or more to the features of the claims. In addition, the examiner has also failed to consider evidence of comparative results provided in the specification.

Choy US 5171705 Does Not
Show or Suggest the Invention

The Choy reference does not meet the limitation of claim 1 that provides for the other (top) surface "N+ region laterally spaced from the P+ doped region and the P-doped well." The rejection on page 4 finds there is "an N+ doped region (the N+ region which is located away from the P doped well) formed in the other surface of the substrate and in the N- doped layer (the N+ doped region is formed in a P doped well, and the P doped well is formed in the N-doped layer[], sic]."

Choy has two N+ regions: a bottom layer and a top region. It is not clear which of the N+ regions in Choy the rejection applied against the claims.

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Accordingly, the following remarks will consider both N+ regions and show how neither meets the limitations of the claims.

Consider first reading the source (top) regions 9 (identified in Fig. 1) on the "N+ region laterally spaced from the P+ doped region" of the claims. That reading is clearly erroneous because in Choy the N+ region 9 abuts the P+ region 10 and is not laterally spaced from it. The P+ region 10 is formed inside the N+ source and thus cannot be spaced from it. The P+ region 10 is a conventional body tie that passes through the source and the well.

The rejection is also erroneous because it finds that the N+ source region of Choy is "located away from the P doped well", presumably P-well 7. That is clearly erroneous because the N+ source region of Choy is formed entirely inside the P-well 7.

It is possible the examiner is reading the N+ layer 3 on the "N+ region laterally spaced from the P+ doped region and the P-doped well." If so, then the rejection is erroneous because it is reading the same element of the reference (N+ region 3) on two different and distinct elements of the claim. Moreover the N+ region 3 is located on the opposite surface from the surface recited in claim 1. Note that the claim requires an N+ layer on one surface (the bottom one) and an N+ region on the other (top) surface. The region 3 of the reference is on the "one" (bottom) surface of the claim and not on the "other" (top) surface.

The Choy reference does not meet the limitation of claim 15 that provides for a P+ doped region in the other (top) surface that is shallower than the N+ doped region in that surface. To the contrary, in Choy the P+ doped body tie region 10 is deeper (not shallower) than the N+ source region.

In summary, the primary reference that the rejection relies upon does not show or suggest the claimed invention. The secondary references of Schlangenotto '428 and '858 do not make up for the deficiencies of Choy.

In summary, the rejection fails to state a *prima facie* case of obviousness. The Choy reference does not show or suggest the P+ P- N- N+ regions and layers and their claimed relationships with respect to each other.

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Schlangenotto '428 and '858 do Not Show or Suggest

Substantial Recombination Centers in the N- and P- Regions

The prior and the final rejection relies upon a finding that the references do not limit the location of recombination centers. Perhaps that is so, but even if true it means the references do not teach the claimed substantial location of the recombination centers in the N- and P- regions. Indeed, such a finding is a tacit admission that the reference fails to show substantial concentrations of recombination centers in the N- and P- regions.

Applicants believe they are the first to show or suggest placing recombination centers in both the P- and N- region of a P+ P- N- N+ structure. The prior art does not show or suggest such a structure with the claimed location of recombination centers.

The rejection observes that the Schlangenotto references do not limit the location of the recombination centers to specific areas of the power diode and concludes that one skilled in the art would form recombination centers throughout the device. See Office Action of 3/11/2005 at page 4.

That observation may be correct, but the conclusion is wrong. The rejection erroneously used a broad disclosure of recombination centers at unspecified locations to support a rejection of claims that specify the locations as in the P- and N- regions. The rejection, at best, uses a genus to reject a species and that is improper.

Assume for the sake of argument that Schlangenotto '428 and '858 disclose recombination centers in diodes. It is well settled law that a disclosure of a genus does not necessarily disclose all species or preclude patentability of one or more species. The applicants are not claiming the genus. Instead claim 1 is for a species: recombination centers comprising noble metal impurities disposed substantially in said N- doped layer and P- doped well. No reference or combination of references shows or suggests putting substantially all the recombination centers in the adjoining lightly doped regions of the device.

The Rejection Fails to Consider Comparative

Result Evidence Found in the Specification

In Applicant's last amendment Applicant relied upon test results in the specification that show the invention greatly improves performance compared to

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prior art structures. Claim 1 calls for substantially all of the recombination centers to reside in the P- and N- regions. By placing the recombination structures substantially in those two regions, the invention teaches away from the general placement of recombination centers as suggested by Schlangenotto '428 and '858. They are both silent about how a particular concentration in the N- and P- regions will improve performance.

The specification contains evidence that demonstrates the invention is not obvious and is patentable over the art of record. Samples of the claimed invention demonstrate a dramatic improvement over prior art control structures. The test data in the specification compare how devices with and without the invention respond to unclamped inductive switching (UIS). That is a measure of how much energy a device may handle during avalanche before it is destroyed. Devices made in accordance with the prior art were compared with devices made in accordance with the invention the invention. Samples 1 and 2 had a UIS capability fifteen times greater than Controls 1 and 2; Sample 3 had a UIS capability of 70 mj where Control 3 has virtually no UIS capability. See Table 1 on page 5 of the application. No prior art suggests that putting recombination centers into the two lightly and oppositely doped P-N- regions of a P+P-N-N+ structure will have such an extraordinary improvement in UIS capability.

Nevertheless, the final rejection has improperly failed to consider this evidence. As such, the rejection is illegal and should be reversed in view of the evidence provided in the specification.

It is well settled that evidence in the specification must be considered. The Federal Circuit reversed the Board when it failed to consider comparative evidence found in the specification. *In re Soni*, 34 USPQ 2d 1684 (Fed. Cir. 1995). The court made the following observation:

Consistent with the rule that all evidence of nonobviousness must be considered when assessing patentability, the PTO must consider comparative data in the specification in determining whether the claimed invention provides unexpected results. *In re Margolis*, 785 F.2d 1029, 1031, 228 USPQ 940, 941-42 (Fed. Cir. 1986). However, "

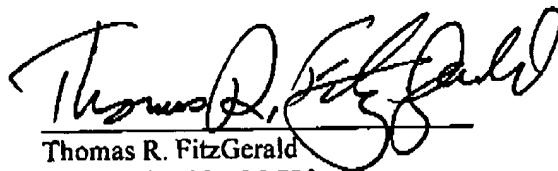
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[i]t is well settled that unexpected results must be established by factual evidence. Mere argument or conclusory statements in the specification does not suffice." *In re De Blauwe*, 736 F.2d 699, 705, 222 USPQ 191, 196 (Fed. Cir. 1984); see also *In re Wood*, 582 F.2d 638, 642, 199 USPQ 137, 140 (CCPA 1978) ("Mere lawyer's arguments and conclusory statements in the specification, unsupported by objective evidence, are insufficient to establish unexpected results."); *In re Lindner*, 457 F.2d 506, 508, 173 USPQ 356, 358 (CCPA 1972) ("[M]ere conclusory statements in the specification . . . are entitled to little weight when the Patent Office questions the efficacy of those statements."). *Id.* at 1687.

In summary, Applicants have demonstrated differences between the invention and the art applied to the claims and have provided persuasive evidence of dramatic and unpredicted results. Reconsideration of the application, including consideration of the evidence of unpredicted results found in Table 1 are requested. In view of the above showing, the invention is patentable over the art of record and a notice of allowance is requested.

Respectfully submitted,

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Date



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